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The Influence of Teacher Teaching Style on Students' Learning Engagement in Sino-Foreign Cooperative Education: The Mediating Effect of Classroom Atmosphere

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Abstract: As global collaboration within higher-education keeps developing, Sino-foreign joint training programmes have turned into a vital component within China's university education system. This study selects undergraduates from such programmes as its participants, intending to explore how instructors' instructional patterns influence learners' academic involvement and verify whether classroom atmosphere can exert regulatory influence upon their connection. Relevant theories and prior findings are sorted out through literature consultation, while firsthand information is gathered via questionnaire investigation. Descriptive statistics, correlation testing, regression examination and hierarchical regression modelling are adopted for data processing. The findings reveal that instructors' instructional patterns can greatly facilitate undergraduates' academic involvement under the joint-education background; classroom atmosphere serves as a notable mediator linking teaching patterns and student academic involvement. This research broadens current investigations concerning Sino-foreign joint higher education. It delivers empirical evidence and actionable suggestions for optimizing instructional approaches, constructing favourable classroom surroundings and encouraging sustained student participation in academic activities.

Keywords: Teaching Style of Teachers; Learning Engagement; Classroom Atmosphere; Sino-Foreign Cooperative Education

1. Introduction

1.1 Research Background

With the development of economic globalization, the exchanges between countries in the field of higher education are also increasing. In recent years, various Sino-foreign joint education projects in China have developed rapidly. These programs integrate excellent overseas educational resources into China's educational system, and bring students a learning experience that combines international views and China's unique characteristics. However, in this special teaching method, China and foreign teachers have different styles in teaching methods and specific teaching methods. Some students in Sino-foreign cooperative education programs are not familiar with these different teaching methods, seldom attend courses, lack of learning effect in different cultures, and low quality of trained talents. These are all problems they face. Therefore, exploring how to improve students' interest in learning in various teaching methods has become an urgent practical problem in the field of Sino-foreign cooperative education.

1.2 Research Significance

1.2.1 Theoretical significance

This study examines the relationships among teaching style, learning engagement and classroom atmosphere in order to clarify their mutual influence. Extending the previous research to the scene of Sino-foreign cooperative education not only increases the theory in this field, but also provides a theoretical framework and practical basis for similar research in the future.

1.2.2 Practical significance

This study provides a theoretical way for teachers working in Sino-foreign cooperative education to improve teaching methods and meet students' learning needs. And provide specific suggestions on creating a good class atmosphere, improving students' interest in learning and improving their ability to cope with different cultures. If we put these things together, we can

effectively promote the high-quality development of talent training in Sino-foreign cooperative education.

1.3 Research Objectives and Content

1.3.1 Research objectives

1) Theoretical purpose: To sort out the core concepts of teachers' instructional styles, students' learning engagement in Sino-foreign cooperative education, and classroom atmosphere, and summarize the relevant theoretical basis of these three points and the research situation at home and abroad. Create a scientifically correct mediating effect model. Clarify the internal mechanism between them. Confirm whether the research hypothesis is reasonable. Better improve the relevant theoretical framework.

2) Practical Objective: This research adopts an empirical approach to figure out the existing situation concerning teaching styles, classroom atmosphere and student learning involvement among Sino-foreign cooperative education majors. It analyzes existing issues and their causes, clarifies the mediating effects of classroom atmosphere, and provides targeted, actionable recommendations for universities and educators. The goal is to effectively enhance student engagement and optimize classroom teaching quality.

1.3.2 Research content

1) Review the literature on teachers' instructional styles, student engagement, classroom atmosphere, and Sino-foreign cooperative education programs to clarify core concepts and research status.

2) Construct a mediating effect model of "teacher teaching style—classroom atmosphere—learning engagement of students in Sino-foreign cooperative education" and propose research hypotheses.

3) Design relevant questionnaires to collect data from undergraduate students in Sino-foreign cooperative education programs.

4) Employ statistical methods to analyze the direct impact of teachers' instructional styles on students' learning engagement, as well as the mediating effect of classroom atmosphere.

5) Based on the research findings, propose targeted practical recommendations and write the research paper.

1.4 Research Methods and Technical Approach

1.4.1 Research methodology

Sample and Data Collection

This study takes Chinese undergraduate universities with Sino-foreign cooperative education programs as the research units, and selects freshmen, sophomores, and juniors as the formal research subjects, excluding seniors. The reason for excluding seniors is that they are faced with graduation internships, thesis writing and other affairs, with insufficient on-campus time and significant differences in learning status from lower-grade students. Inclusion would affect the homogeneity of sample data and fail to accurately reflect the correlation between core research variables.

A stratified convenience sampling method was adopted. The stratification dimensions covered the core control variables of the study, and questionnaires were randomly distributed within each stratum according to university distribution and class size. The sample structure was strictly controlled to be consistent with the overall distribution of students enrolled in Sino-foreign cooperative education programs in Chinese undergraduate universities, ensuring the representativeness of the sample. Considering the sample size requirements of structural equation modeling and hierarchical regression analysis, 300 questionnaires were actually distributed. The questionnaire distribution followed the principles of anonymity, confidentiality, and voluntary participation. Before distribution, participants were informed in detail about the research purpose, data usage, and confidentiality commitments to eliminate their concerns and ensure the authenticity of questionnaire responses.

After recovery, the data were systematically cleaned with clear criteria for eliminating invalid questionnaires: first, responses with an excessively short completion time (less than half of the average time for the scale) were judged as random answers; second, answers with obvious regularity (such as consecutive identical options or full selection of extreme values) were judged as invalid; third, missing core variable items or demographic variable items that prevented subsequent statistical analysis were excluded. Following the data-clearing process, 267 qualified questionnaire replies were collected, attaining an 89% valid sample rate, which is higher than the originally planned threshold of 80%. The acquired sample meets the fundamental sampling standards of structural

equation modeling and hierarchical regression testing, supplying dependable and comprehensive data evidence for later empirical research.

Data Analysis Methods

• Descriptive Statistics and Reliability & Validity Test: First, descriptive statistical analysis was conducted on the demographic variables of the valid sample, including gender, grade, major, and type of Sino-foreign cooperative education program, to intuitively show general features of the collected sample and interpret grouping properties of the dataset, preparing essential conditions for follow-up difference examination and regression-based analysis. Second, reliability and validity tests were carried out. Cronbach's α coefficient was employed to gauge the internal consistency for the three core scales (teacher teaching style, classroom atmosphere, and student learning engagement), with $\alpha > 0.7$ indicating good reliability and reliable data. Subsequently, factor analysis was combined to test the structural validity of the scales, ensuring the discrimination and convergence of each variable's measurement items, verifying the scientificity of the measurement tools, and guaranteeing the credibility of subsequent analysis results.

• Correlation and Difference Analysis: Pearson correlation analysis was used to preliminarily explore the correlations between the dimensions of teacher teaching style, classroom atmosphere, and student learning engagement. Independent samples t-test was adopted to examine the differences in learning engagement among different groups of students.

• Regression and Mediating Effect Test: We built a multiple linear regression model by taking each dimension of teacher teaching style as the predictor variable and student learning engagement as the outcome variable, so as to examine the direct predictive impact that teacher teaching style exerts on student learning engagement and validate the core research hypothesis that "teacher teaching style can produce a marked positive influence on the learning engagement of students within Sino-foreign joint education programs". After controlling demographic factors, hierarchical regression analysis was adopted to add interaction terms for examining the mediating impact of classroom atmosphere. When the mediating impact turns out statistically significant, simple slope analysis would be implemented to plot an interaction-effect diagram, visually illustrating how the impacts of teaching style vary across different levels of classroom atmosphere.

Correspondence between Data Analysis and Conclusions

This empirical investigation draws on 267 valid samples for analysis. The analytical arrangement is as follows: first, reliability and validity tests will be carried out to check whether the measurement tools are sound and effective and whether the data quality meets relevant criteria; second, correlation analysis will be used to explore associations among core variables and provide preliminary evidence for the direct-effect hypothesis; third, multiple linear regression will be applied to examine the predictive effect of teacher teaching style on student learning engagement, and hierarchical regression will be adopted to test the mediating impact of classroom atmosphere. The whole analytical framework is consistent with the study design, and the interpretation will be based on the actual statistical outcomes.

1.4.2 Technical approach

This study follows the logical framework of "theoretical foundation—research design—empirical analysis—conclusion and recommendations," establishing a clear technical roadmap: 1. Literature review and theoretical preparation: By reviewing domestic and international literature, core concepts are defined, theoretical foundations are organized, research status is summarized, and the research topic and direction are determined. 2. Research design and model construction: Based on theoretical foundations, a mediation effect model is developed, specific research hypotheses are proposed, and survey questionnaires and research plans are designed. 3. data collection and preprocessing: questionnaire surveys, collecting and selecting correct data, and ending data input and data sorting. 4.empirical data analysis: use statistical software for descriptive statistics, reliability and validity check, correlation analysis, and regression analysis. 5. Result discussion and summary: analyze the collected research findings and summarize the conclusions, find out new and insufficient places, put forward useful suggestions, and write a complete paper to test the proposed research hypotheses.

2. Literature Review and Theoretical

Framework

2.1 Definition of Core Concepts

Teacher's questioning style: this is created by teachers in their long work experience, which brings together teaching ideas, methods and practices in a very distinctive form. It is a stable pedagogical artistry with only teachers [1]. More popularly speaking, teaching style is a constant feature, an effective classroom behavior model and a teacher's personal character that teachers have cultivated for a long time. It can be completed under the influence of teachers' subject knowledge, personal character and educational ideas. It is composed of the interaction of teaching methods, technology, language usage and classroom arrangement, and its characteristics are stability, particularity, practical use and integrity.

Learning engagement: Learning engagement is defined as a positive, satisfied and learning-related psychological state, which is divided into three parts: vigor, dedication and absorption. In fact, students are full of energy, hard work and deep concentration in learning activities [2]. This concept originated from the concept of work engagement in psychology, and was later incorporated into teaching research, which gradually became an important content to evaluate students' learning results. Many scholars agree that learning engagement is an integrated multi-dimensional concept, which includes both the positive attitude of people studying in the academic field and the active participation behavior. For the undergraduates who joined Sino Foreign Joint Education Programs, learning engagement is more than just classroom action participation. Including personal exploration of cross-cultural knowledge and conscious familiarity with the classroom environment of bilingual, these are the decisive factors for them to be familiar with the international curriculum mechanism and achieve satisfactory academic results.

Classroom atmosphere: Classroom atmosphere refers to the main atmosphere of the learning place, which consists of three parts: the relationship between friends, the relationship between teachers and students and the class regulations [3]. Also known as classroom psychological atmosphere, it refers to the different psychological environment and air feeling created by teacher-student interaction, dialogue between friends, classroom environment and mood during class. This is a very important part of classroom ecology.

According to the rules of Sino-foreign cooperative education: People's Republic of China on Sino-foreign cooperative education (implemented in 2003), the core goal of this practice is to introduce excellent foreign educational resources, integrate advanced educational concepts and teaching methods at home and abroad, and cultivate people with broad national vision, different cultural speaking ability, professional ability and ability to do many things. In particular, this study investigated the undergraduate program of this practice. In these places, students have both the learning characteristics of ordinary college students and the special needs of international education. They are faced with many problems such as getting used to different cultures, learning in two languages, and combining different teaching methods at home and abroad.

2.2 Current Research Status at Home and Abroad

2.2.1 Research on teaching styles and learning engagement

Within the landscape of global higher education in the 21st century, improving teaching quality remains a shared pursuit across nations. Countries including the United States, the United Kingdom and Australia have accumulated rich practical experience in quality-oriented educational development. Western academia has built well-established analytical frameworks for exploring teaching styles, summarizing five major theoretical categories: methodological, behavioral, interactional, trait-based, and pattern-based, which provide multi-angle interpretations of teacher teaching styles. Higher education is becoming more and more popular in China. The focus of policy and research has gradually changed from expanding scale to improving quality. In this case, China scholars put forward some representative theories such as "teaching as art theory", "teaching performance theory" and "performance mode theory" [4]. Other empirical evidence shows that there is a clear and good relationship between teachers' teaching methods and students' inherent learning motivation and active participation in learning. Teaching style is an important leading factor affecting college students' learning participation [5]. Flexible and happy classroom teaching methods can stimulate students' interest in

learning, but excellent and uninspired classrooms are prone to have bad learning attitudes.

2.2.2 Research on classroom atmosphere

Wang and Degol, foreign researchers, put forward a four-region model that includes four elements: academic, community, safety and institutional environment. Based on this framework, domestic researcher He Minmin concretized this concept into four aspects: interpersonal atmosphere, classroom atmosphere, safety atmosphere and institutional physical environment [9]. So far, the research has made clear the definition and elements of classroom atmosphere, and there is a common opinion in the research at home and abroad, that is, the better classroom atmosphere is, the higher the participation of students in learning. Good and healthy classroom atmosphere creates a relaxing and pleasant space for students, stimulates intellectual curiosity, improves attention [6], and promotes students' active participation in learning. But there are still some challenges in the research so far. That is, many existing studies are investigating general student gatherings, and there are few analyses focusing on specific groups.

2.2.3 Relevant research on sino-foreign cooperative education

The learning model used in Sino-foreign cooperative education is flexible and diverse, which can provide high-quality learning experience according to the needs of different students and resources. However, in this model, students are faced with problems such as low learning motivation and insufficient active learning ability. The characteristic of the course making method is to deal with the differences. The existing research has established a curriculum system model consisting of five important factors [8]. This study also points out that students encounter difficulties in adapting to different cultures.

2.3 Research Hypothesis and Model Construction

2.3.1 Research hypothesis

Drawing upon the preceding theoretical basis and literature summary, alongside real-world teaching practices within Sino-foreign joint education programs, this research puts forward the following research hypotheses:

H1: Teachers' instructional approaches exert a notable positive predictive influence on learning engagement among students receiving Sino-foreign joint education.

H2: Classroom atmosphere plays a mediating role in the influence of teachers' teaching styles on students' learning engagement in Sino-foreign cooperative education.

2.3.2 Theoretical model

In accordance with the two previously proposed research hypotheses, this study establishes a theoretical mediating-effect model, which can be observed in Figure 1.

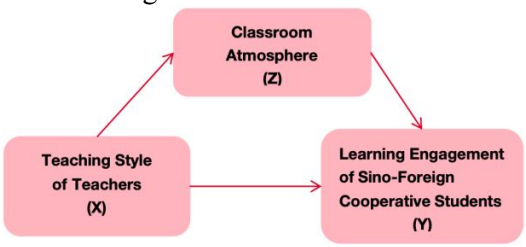


Figure 1. Theoretical Research Model

3. Research Design

3.1 Research Object and Sampling Method

The research subjects are undergraduate students from freshman to junior year. Due to reasons such as graduation internships and thesis writing, senior students have less classroom participation time and a special learning state, so they are not included in the research scope.

Adopting stratified convenience sampling method for sampling, the sample is first divided into three levels of freshman, sophomore, and junior according to grade, and then stratified according to major and gender to ensure a balanced distribution of the sample. In this survey, 300 questionnaires were distributed and 300 returns were obtained. Surveys containing incomplete answers or identical repetitive responses were discarded. Finally, 267 valid questionnaires were retained, yielding an 89 % valid sample rate that satisfies the sample-size criteria for empirical investigation.

3.2 Questionnaire Design and Variable Measurement

The questionnaire consists of three mature scales, all of which use Likert scoring method:

Teacher Teaching Style Scale (independent variable X): Using the "Structure and Adjectives Evaluation Questionnaire for Effective Teacher Teaching Styles" developed by He Wen, Zhang Qing and Li Wenjun [10], with a 7-point scoring system (1=strongly disagree, 7=strongly agree), including 4 dimensions of humorous and active,

rigorous and logical, caring and sharing, and innovative and exploratory, with 18 items. The Cronbach's alpha coefficient of the total scale is 0.913.

College Student Learning Engagement Scale (Dependent Variable Y): Using the revised Chinese version of the Learning Engagement Scale by Fang Laitan, Shi Kan, and Zhang Fenghua [11], with a 7-point scoring system (1=never, 7=always), including 3 dimensions of vitality, dedication, and focus, 17 items, and a Cronbach's alpha coefficient of 0.951 for the total scale.

Classroom Atmosphere Scale (Mediating Variable Z): The "Perceived Class Interpersonal Harmony and Its Relationship with Social Behavior" scale developed by Chen Binbin and Li Dan [7] was used, with a 5-point scoring system (1=never, 5=always), including three dimensions of class relationship, teacher-student relationship, and class organization, and 20 items. The Cronbach's alpha coefficients for each scale were 0.82, 0.85, and 0.72, respectively.

3.3 Data Processing Methods

Using t-test and analysis of variance to examine the differences in the main variables across different demographic backgrounds. Using Pearson correlation analysis to test the degree of correlation between variables. Using the PROCESS macro program in SPSS for hierarchical regression analysis to test the mediating effect of classroom atmosphere.

4. Data Analysis and Results

4.1 Descriptive statistical analysis

Based on the 267 valid questionnaire responses, the collected data went through descriptive processing, and the outcomes indicated that:

(1). Demographic distribution of samples was reasonable, covering freshmen, sophomores and juniors of Sino-foreign cooperative programs.

(2). The mean and standard deviation of teaching style, classroom atmosphere and learning engagement were calculated. No abnormal values appeared, laying a solid foundation for subsequent analysis.

4.2 Reliability and Validity Testing

The Cronbach's α coefficients for all scales exceeded 0.7, indicating satisfactory internal consistency reliability. Factor analysis revealed that the factor loadings for each variable met the required standards, suggesting that the scales possess good construct validity.

4.3 Correlation Analysis

Pearson correlation analysis indicated a significant correlation between teacher teaching style and student learning engagement ($r = 0.814$, $p < 0.01$), a significant correlation between teacher teaching style and classroom atmosphere ($r = 0.784$, $p < 0.01$), and a significant correlation between classroom atmosphere and student learning engagement ($r = 0.790$, $p < 0.01$). These findings lay the foundation for subsequent regression analyses.

4.4 Regression Analysis and Mediation Effect Testing

4.4.1 Main effect test

With teachers' instructional styles set as the predictor variable and student learning engagement as the outcome variable, we carried out regression estimation after controlling for gender, major and grade level. The regression outputs indicated that teachers' instructional styles exerted a marked positive predictive influence on student learning engagement ($\beta = 0.795$, $p < 0.001$). The model $R2 = 0.640$, adjusted $R2 = 0.633$, indicating that teacher teaching style could explain 64.0% of the variation in student learning engagement. The overall F value of the model was 92.779 ($p < 0.001$), which suggested the model was statistically significant.

4.4.2 Mediation effect test

Hierarchical regression modelling was applied to examine whether classroom atmosphere acts as a mediator linking teachers' instructional styles to student learning engagement.

To begin with, control variables including gender, major and grade level were entered into the regression model.

In the next stage, we predict the classroom atmosphere by adding the independent variable teacher teaching style. The results show that teacher teaching style strongly predicts classroom atmosphere ($\beta = 0.766$, $p < 0.001$). The R2 of this model is 0.607, the adjusted R2 is 0.599, and the overall F value is 80.485($p = 0.000$). In the last stage, both independent variables and intermediate variables are put into the model, and the student learning engagement is predicted. The results show that classroom atmosphere is very positive in

predicting the student learning engagement (β=0.515, p<0.001). At the same time, the direct influence of teacher teaching style on student learning engagement is also significant (β=0.365, p<0.001). After adding the intermediate variable, the R2 of the model rises to 0.692, the adjusted R2 is 0.685, and the overall F value is 97.535(p=0.000). All three important paths are statistically significant, which shows that classroom atmosphere has partial mediating role between teacher teaching style and student learning engagement.

5. Discussion and Analysis

5.1 Interpretation of Findings

5.1.1 Positive impact of teacher teaching style on learning engagement of students in sino-foreign cooperative education programs

The empirical findings show us that teachers' teaching methods have a very good influence on the learning engagement of students who have joined Sino Foreign Joint Education Programmes. The results are the same as those of the study at home and abroad so far, and are also consistent with the actual teaching situation of these training projects.

5.1.2 Significant positive mediating role of classroom atmosphere

The results show that classroom atmosphere can adjust the relationship between teachers' teaching methods and students' learning enthusiasm in a good form. The classroom atmosphere, which supports each other, will enhance the ability of teaching methods to promote students' participation in courses. This result confirms the central idea put forward by classroom ecology theory.

5.2 Research Innovations

(1). Up to now, the research has been centered on "general student groups", but this research has taken "students in sino-foreign cooperative education programs" as the object, aiming at this specific group.

(2) This study takes classroom atmosphere as a mediator, clarifies the conditions that teaching style affects learning engagement, and enriches the theoretical framework of related research.

5.3 Limitations

When reading the results, you should know that this survey has several methodological limitations. First of all, this study uses cross-sectional scheme to collect all the information at one time. Such a design cannot infer the cause and effect. Therefore, don't regard the clear connection found as the real relationship between cause and effect. Follow-up longitudinal research is suggested to sort out the time sequence among teacher teaching style, classroom atmosphere and student learning engagement. Secondly, all data originate from self-reported questionnaires. Even though anonymity was guaranteed during distribution, respondents may adjust their answers to appear more socially desirable, which might introduce bias and affect data precision. Thirdly, stratified convenience sampling was adopted for participant recruitment. While stratification operations were applied to balance sample distribution, this non-probability sampling approach still carries potential selection bias, which prevents the sample from fully standing for all undergraduates enrolled in Sino-foreign cooperative education programmes nationwide. Fourth, be careful when using the present results in other places. Because the participants in this study are only undergraduates of Sino-foreign cooperative programmes of Chinese University in mainland Chinese, this result may not be directly applied to other educational methods, different regions and overseas learning places.

6. Conclusion and Recommendations

6.1 Research Conclusions

Teachers' teaching methods can greatly improve the learning enthusiasm of college students in Sino-foreign joint education programs. Classroom atmosphere can adjust the relationship between teaching methods and students' participation in courses. A mutually supportive learning place can further consolidate the good results brought by various teaching methods.

6.2 Practical Recommendations

6.2.1 Suggested measures for teaching staff

In line with the characteristics of students in Sino-foreign cooperative programs, we should flexibly use humorous, lively, novel and together-seeking classroom teaching methods to improve teaching methods and enhance classroom attraction. Teachers cultivate a good relationship between students and teachers, pay attention to learners' adaptation requirements to different cultures, and make them feel good in

the learning community.

6.2.2 Recommendations for institutions

Teaching training is provided for teachers, so that they can have a variety of teaching methods and enhance their ability to create a good classroom atmosphere. Improve the classroom management mechanism, support students to participate in classroom interaction, and cultivate a non-discriminatory classroom atmosphere with peace of mind.

6.2.3 Recommendations for students

Actively cooperate with various teaching style, actively participate in classroom communication, and improve the ability and participation of cross-cultural learning.

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